UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2010 question paper

for the guidance of teachers

9700 BIOLOGY

9700/51 Paper 5 (Planning, Analysis and Evaluation), maximum raw mark 30

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the May/June 2010 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

UNIVERSITY of CAMBRIDGE
International Examinations

Mark schemes abbreviations:

- **;** separates marking points
- **/** alternative answers for the same point
- **R** reject
- **A** accept (for answers correctly cued by the question, or guidance for examiners)
- **AW** alternative wording (where responses vary more than usual)
- **underline** actual word given must be used by candidate (grammatical variants excepted)
- **max** indicates the maximum number of marks that can be given

© UCLES 2010

Question	Expected answer	Extra guidance	Mark	AO
1 (a) (i)	oxygen / gas / air, produced (by photosynthesis);	Do not allow: use / production of carbon dioxide / respiration / bubbles Allow: losing / releasing oxygen, etc.	[1]	M
(ii)	7 of: *independent variable* 1. a method of varying light intensity **or** use low light intensity; 2. ref. to a method of measuring light intensity; 3. ref. to a method of eliminating other light sources; 4. ref. to testing leaf discs for the two locations separately; *dependent variable* 5. ref. to a method of measuring photosynthesis by rising of discs; 6. ref to time taken; *standardising variables (max 3)* 7. ref. to discs from more than one leaf (from each location); 8. ref. leaf discs all being same diameter / size / number / mass. 9. ref. to same volume of hydrogen carbonate solution (in syringe); 10. ref. to using fresh hydrogen carbonate solution for each measurement / same concentration of H carbonate;	1. e.g. lamp (with standard bulb) and vary distance / lamp at same distance and vary wattage / lamp at same distance and use filters of different thickness / AW 2. e.g. (light) meter / photodiode / light dependent resistor / photometer / low wattage / 60 or below Allow ref. to using a camera meter 3. e.g. dark room or box for measurement 4. often implied 5. Do not allow: counting bubbles / leaves rising 6. e.g. time for (all or a specified number of) discs to rise / specified time and count the number of discs floating / distance risen in stated time Allow: ecf time for bubble counting 8. Allow: use same straw for cutting 9/10 Watch for confusion with hydrogen carbonate indicator – but ecf		

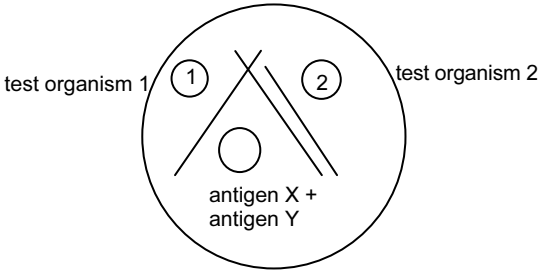
© UCLES 2010

Question	Expected answer	Extra guidance	Mark	AO
	11. ref. to method of standardising temperature; 12. ref. to acclimatising before measuring; *Reliability* 13. ref. to repeating at least three times and taking mean; *safety:* 14. ref. to low risk investigation / AW **or** any suitable safety concern + precaution;	11. water bath / incubator / controlled room Do not allow: room temp Do not allow: pH for standardising variables 13. Allow: several or many Allow: to remove anomalies / outliers 14. e.g. hydrogen carbonate + gloves / eye protection dry hands to prevent electrical shock / AW Do not allow: be careful unqualified Do not allow: care with cutting	[7]	M
(b) (i)	*x* – light intensity *y* – rate of photosynthesis; suitable unit on one axis; Ignore other units	*light* – e.g. arbitrary / lux / lumens / candela / $1/d^2$ allow, watts / kilowatts / voltage *photosynthesis*. e.g. 1/time / arbitrary Allow: ecf for unit mark if axes wrong	[2]	D
(ii)	(rate of) photosynthesis / gas production / oxygen production for shade leaf (discs) is higher (than exposed discs) at low intensity / ref. figures; photosynthesis / gas production / oxygen production begins at lower light intensity in shade leaf discs; Allow: at high(er) light intensity shade leaves level off / AW, whilst sun leaves continue to rise / AW;	Allow: reverse arguments for sun leaves at low intensity Ignore: 'initial' if the answer is about rate Do not allow: answers that imply time e.g. starts sooner / before …. Ignore: idea that photosynthesis stops at higher light intensities assume that 'it' or 'they' is the shade leaves if not stated in the answer	[2]	E

© UCLES 2010

(c) (i)	$\underline{0.2mm^2;}$	must have units.	[1]	D
(ii)	185;; two marks if some working shown look for working if answer wrong if 0.196..... used ecf and take 188 or 189 – whole nos. only if other values in **(c) (i)** ecf by checking the calculation	$\frac{37}{0.2}$ = 185 1/0.2 = 5 5 × 37 = 185 If calculation correct but answer not transferred to table allow both marks	[2]	D
(iii)	there is no difference in the, number / frequency, of stomata in, exposed / sun, leaves and, shaded / shade, leaves;	Allow: any variation on the basic idea e.g. the (observed) means / number, are the same there is no difference (between the two leaf types) Do not allow: the experimental hypothesis	[1]	D
(iv)	t-test; comparing two means / means have a similar standard deviation / data has a normal distribution / is continuous / is not discrete;	Do not allow: 2 sets of data are being compared ecf if the test name is incorrect Allow: a correct reason for the t-test.	[2]	D
(d)	1 of: sun leaves have (fewer stomata) as more likely to lose water / transpire; ora shade leaves have (more stomata) to increase gas / CO_2 diffusion / AW;	Do not allow: to increase photosynthesis unqualified Do not allow: – stomata related to light absorption Watch out for statements that there are more stomata in sun leaves without any qualification. Assume comment applies to shade leaves if not stated. Do not allow: oxygen is given out	[1]	C
		Total:	**[19]**	

© UCLES 2010

2 (a) (i)	1 of: ref. to thickness / volume / consistency / concentration of, agar / depth of wells / volume of wells / distance of antigen wells from test organism wells; ref to temperature; ref. to volume serum / antigen volume;	Do not allow: amount for any quantitative answer Do not allow: pH	[1]	P
(ii)	the serum / antibody / antibodies (from the test organisms);	Do not allow: if antigen also mentioned Allow: organism from which serum / antibody came Ignore amount / volume etc.	[1]	P
(iii)	2 lines / 1 thick line, between 2 and antigens; 1 line between 1 and antigens;	 Allow: 2 marks if lines do not intersect If the lines are reversed / spread outside dish max. 1 Do not allow: if the lines are inverted / lines cross wells	[2]	C
(b)	2 of: 1. ref. to all antibodies not forming precipitates / AW; 2. ref. to sensitivity / AW; 3. ref. to more qualitative / difficult to quantify; 4. ref. to, slow rate / inability to diffuse of some antibodies; 5. ref to problem of identifying individual antigens / AW;	2. the idea test will not detect low concentrations 4. Allow: – if 'slow' is in the context of getting results of tests	[2]	E

© UCLES 2010

(c) (i)	*group 1* ref. to the idea of a control; *group 2 and 3* ref. to idea of finding how many organisms, give immunity / needed; *group 4* ref. to idea of finding the number of, inoculations / boosters, needed;	Be careful they are not conclusions e.g. how many are needed (to make the vaccine work) e.g. to see if another booster is needed	[3]	P
(ii)	2 of: ref. to (information that mutant) *Plasmodium* breeds / develops / AW in mosquitoes; ref. to breeding mosquitoes / culturing in salivary gland tissue / AW; ref. to extracting (*Plasmodium)* from salivary glands / culture of salivary glands;	 Allow: idea of a culture medium similar to salivary gland / saliva Ignore: from the liver of mice	[2]	M
		Total:	**[11]**	

© UCLES 2010